BITUMINOUS CONCRETE PAVEMENT

63-10.0100 GENERAL

This information, in general, is intended to furnish instructions and procedures necessary in the construction of bituminous pavement of the plant-mix type regardless of gradation of aggregates, kind and quantity of bituminous material, or pavement use. This guidance information provides, in considerable detail, the methods employed, equipment, and inspection necessary in performing the construction of bituminous mixtures constructed on a prepared foundation, meeting the specific requirements of the contract, and in reasonably close conformity with the lines, grades, thickness, and typical section shown on the plans, or within the tolerances specified or established.

63-10.0200 RESPONSIBILITIES

.0210 The Project Engineer - The Project Engineer should assign as a minimum the following personnel to each paving operation:

1 - Paving Inspector
1 - Ticket Taker (when available)

In some cases, the nature of the contractor's operations may require two or more paving inspectors. An inspector should stay with each paving operation and additional inspectors may be necessary to oversee the operation when available. It may also be necessary to add additional ticket takers on projects where significant tonnage is laid each day.

Prior to starting each project, the Project Engineer needs to meet with the Contractor’s Personnel and the inspectors to discuss all of the project’s specifications and expectations so there will be no questions of the required final results.

.0220 The District Materials Engineer - The District Materials Engineer (DME) is generally charged with responsibility for materials testing, mix design and plant approval and set-up. The Materials Manual will delineate these responsibilities, so they will not be discussed herein. It is recognized that the DME and the Project Engineer have overlapping responsibilities to a certain extent and it is incumbent upon both parties to cooperate and work closely together to achieve the best possible job.

Probably the single most critical factor of this cooperation is communication.

Both the Project Engineer and the DME must keep each other up-to-date with the contractor's plans and the current situation if each party is to get the job done.

63-10.0300 INITIAL PROJECT PREPARATION

.0310 Resurfacing Project – It is strongly recommended that the project engineer make every attempt to meet with the maintenance engineer while the project is being developed to add input. After receiving the plans and/or the proposal, and contract for a bituminous resurfacing project, the Project Engineer and assigned paving inspector(s) should read the specific requirements for the proposed construction. A prepavement meeting with the contractor and maintenance engineer should be scheduled for the proposed project and certain things should be noted:

Careful examination of the condition of the existing surface should be made to determine where and how much leveling and wedging is needed to correct the typical section, grade, and areas where the pavement has deteriated to the point that normal resurfacing does not correct (see leveling and wedging note below).

The type of equipment should be discussed. If the roadway is eighteen foot wide, the contractor should not expect to perform the work with a ten foot paver without modifications. If a pavement wedge is required and the material is being placed monolithically, then the contractor should have a paver with a modified screed.

The width which is to receive and accommodate the proposed overlay. Whenever possible, a constant width pavement should be maintained. It is also imperative that obstructions be dealt with appropriately. Obstructions can be delineated by signing, striping, or corrected by maintenance. Sudden changes to width should be avoided.

Care should be taken to not increase drop off conditions. When the project contains the special note for pavement wedge, the material should be placed separately or with a paver that has a modified screed.

The length of the project shall be checked against the project description in the contract.

Any corrective work needed prior to construction which is not within the scope of the contract should immediately be referred to the District Office so any necessary repairs or corrections may be made before construction is started.

.0320 Staking - The Project Engineer should send a staking party to the project to

measure its proposed length and record its beginning and ending stations. Station stakes should be set laterally outside the limits of construction at longitudinal intervals not to exceed 500 feet to be used in proportioning and distributing quantities during the construction process. The stationing stakes should be set in a conspicuous location, readily visible to the paving inspector.

.0330 Approaches, Entrances and Mail Box Turnouts - These type installations shall be constructed in accordance with the applicable version of Standard Drawing RPM 110. No deviation from the requirements in this Standard Drawing are permitted without the concurrence of the Central Office, Division of Construction.

.0340 Checking Quantities - From the field measurements, the Project Engineer or the paving inspector should compute the gross square yards. Using the prescribed rate of application per square yard of bituminous base, binder, or surface as indicated in the plans or proposal, the total tons for the project should be computed. Any significant differences between these calculated quantities and those set up in the contract should be reported to the District Construction Office as soon as possible so that quantities can be adjusted to achieve the desired design thickness. Neither the Project Engineer nor the paving inspector have the authority to overrun the quantities on any bituminous concrete paving project without proper authorization, nor should the thickness of the mat be either decreased or increased from the specified depth without authorization. In addition, the width of the roadway should not be changed without authorization.

.0350 Patching Projects - In general, patching projects are similar to resurfacing projects and shall be treated similar. The above procedures shall apply with suitable modifications for the peculiarities of a patching project. *Unless specified otherwise in the proposal, patching shall be full width. Patches in the center of the road, on one side, or any partial width are not to be constructed*. Staking will be similar to resurfacing contracts. Tack shall be applied at the rate prescribed in the proposal. The Project Engineer or a designated assistant shall ride the roads under contract, measure and stake the specific patch locations(beginning and ending) and calculate necessary quantities. Tack may be incidental to the bid price of the bituminous material, however, quantities should be calculated for testing and accountability. If additional pay quantities are needed, the Project Engineer should consult with the District Construction Office.

63-10.0400 WEDGING OR LEVELING COURSES

Leveling and wedging shall be done in accordance with Section 403 of the Standard Specifications.

.0410 Resurfacing – The contractor shall review existing pavements, which are specified to receive a wedging or leveling course, prior to an overlay. The contractor shall check the existing surface for bumps, sags, changes in crown and rate of superelevation. All detected irregularities shall be corrected, so far as possible and practical, by this wedging or leveling course in advance of the final surface course. Be careful to not adversely effect the superelevation in the leveling process. It may be necessary to carry the course full width to maintain the proper superelevation.

Checking of the existing surface for irregularities can be done in a variety of ways. One way is to drive the roadway to be surfaced at various speeds noting places where corrective work is needed. These areas can then be stringlined or straightedged and marked with paint to indicate the extreme edges of the areas to be wedged.

.0420 Adjusting Manholes - When resurfacing municipal projects, it is difficult to anticipate final elevation of the riding surface until all leveling, wedging and/or base courses have been completed. Because of this difficulty it is suggested that an attempt not be made to preset manhole frames or other castings until this preliminary work has been substantially completed. Accordingly, they should be referenced, paved over, then dug out and adjusted just prior to placing the final surface course to eliminate any unsightly appearance of patching around the fixture in the finished surface course and to minimize rough spots.

Payment for adjusting manholes shall be in accordance with Section 403.05.01 of the "Standard Specifications For Road And Bridge Construction". This specification prescribes the payment due for adjusting manholes if this work is not originally set up as a pay item. This work may or may not be originally set up as a pay item. Prior to beginning work, the Project Engineer or Project Inspector needs to review the project paving limits on site, and compare those findings to the project documents to determine the required use of this specification. If the project does not have an adjustment pay item set up on the project, and the on site project review shows that adjustments are necessary, the Project Engineer will be required to have a supplemental pay item(s) created. The creation of a supplemental pay item(s) will require a Funding Line added to the job for Utility Reimbursable Costs, followed by a Change Order using the new Funding Line to pay for “Adjust Manhole Masonry” and/or “Adjust Manhole Ring” depending on site requirements.

63-10.0500 TACK COAT

.0510 General - The application of tack coats shall be in accordance with Section 406

of the Standard Specifications. The tack coat normally consists of an emulsified asphalt material to be applied at a specified rate per square yard on an existing surface. The purpose of the tack coat is to increase bond between the old and new surface. If the tack coat is too heavy, the tack may act as a lubricant between the two surfaces causing the mat to slip when rolled. If the tack coat is not adequate, the mat will not bond to the underlying course properly and may slip under the roller causing waving or map cracking of the mat being placed. In either case, subsequent raveling will occur and deterioration of the surface will eventually develop.

.0520 Traffic - On projects where traffic must be maintained during the resurfacing operation, traffic should be held up while applying tack to prevent spray from getting on vehicles. Traffic should be kept off a freshly tacked surface until the tack breaks, if at all possible, since tack is initially slick and may constitute a danger to a moving vehicle. Tack breaks quicker in the summer when the pavement is hot than it does in the spring or fall when it is cooler. This should be kept in mind when applying tack under traffic conditions.

.0530 Applying Tack - The rate of tack to provide an adequate uniform coat is dependent upon the condition of the existing surface to be tacked and the application rates specified in Section 406.03 of the Specifications and/or the contract. The tack coat should be applied well in advance of the paving operation to allow all water to evaporate before the bituminous mat is placed. This chemical process is termed “Breaking” or “Setting”. The color of the tack will change to a dark brown color when it breaks. This breaking will occur a short time after application with the exact length of time depending on the ambient air and pavement temperatures. Work should be planned so that no more tack coat than is necessary for the day's operation is placed on the surface. If maintenance of traffic is involved, the tack application should be modified so that cars do not have to drive through tack. Tack may be also washed off the pavement by a heavy rain and have to be replaced when the pavement is dry. Existing traffic and weather conditions may curtail the distance tack can be placed ahead of the paving operation. In addition, sand can also be used by the contractor to protect traffic and structures within the project limits from the effects of the tack,. This will also assist in preventing excess tack from leaving the project.

.0540 Acceptance and Payment - The paving inspector should calculate and record the quantity of tack material used each day; this is to determine if the required application rate is being met per the Standard Specification 406.03.03. Tack that is destroyed by rain or other unanticipated incidents is normally considered the contractor's responsibility. Procedures for accepting tack material shall be as prescribed in the Material's Manual of Field Sampling and Testing Practices.

Refer to Section 63-10.0640 under "Prime Coats" in this manual for additional information.

63-10.0600 CURING SEAL

.0610 General - The application of curing seal shall be in accordance with Section 406 of the Standard Specifications. In general, bituminous curing seals are applied only to granular type bases which are to receive an overlay of bituminous concrete surface or some type of seal coat. The intent of the bituminous material is to penetrate and fill the voids of granular base. This not only keys and cements the base aggregates together, but also forms a moisture barrier and aids in preventing capillary attraction of water into the uppermost layer or layers of the surface structure.

.0620 Surface Preparation - New projects which are to receive an application of bituminous curing seal shall have a roadbed surface that is dense, free from loose extraneous material, and contain sufficient moisture to prevent penetration of the asphalt material. The roadway should be shaped at least six inches beyond the edges of the proposed bituminous overlay.

.0630 Curing Seal Application – Curing Seal shall not be applied until the grade has been inspected and approved by the Project Engineer or the Paving Inspector.

The Project Engineer or the paving inspector should compute the surface area to be sealed. In this computation, the curing seal should be at least six inches wider than the normal surface width to insure that all the areas underneath the pavement have an application of seal coat. The gross area to be sealed should also include the areas involved in curve widenings, road approaches, and entranceways. Using the specified rate of application per square yard indicated in the Standard Specification 406.03.03 C), the total gallons necessary to seal coat the project should be computed.

Before the curing seal is applied, the length of the spray bar should be adjusted to conform to the width of application being made without overlapping. It is good practice during the sealing operation to seal the normal roadway width first, then go back and seal curve widening, road approaches, and entranceways. At the time of application, the temperature of seal material shall be within the range indicated in Section 406.03.03 of the Standard Specifications.

Under extreme dry and dusty conditions and prior to the seal treatment, a light application of water may be applied uniformly to the area to be sealed. This will not only prevent the seal material from collecting in balls in an otherwise dusty

condition, but, as the water percolates into the voids of the granular base, the seal will be molecularly attracted, resulting in better penetration.

The curing seal should be allowed to cure before being covered by the bituminous course unless otherwise approved by the Project Engineer. It is the responsibility of the contractor to protect and maintain the curing seal against damage. All damaged areas must be repaired before being covered by the next bituminous course. The contractor shall provide all barricades, warning signs, and flagmen when necessary to ensure the safety of the traveling public, and shall further provide for the public convenience and safety as specified in Section 107 of the Standard Specifications. All traffic control, for the traveling public and public convenience shall be included in the projects pay item "Maintain and Control Traffic". In addition, sand can also be used by the contractor to protect traffic and structures within the project limits from the effects of the tack. This will also assist in preventing excess tack from leaving the project.

63-10.0700 Weighing and Verification

.0710 General - Every shipment of liquid asphalt material to the project shall be accompanied by the Certified Weight Ticket ("Green Sheet") from the supplier in accordance with procedures prescribed in the Materials Manual of Field Sampling and Testing Practices. The Paving Inspector must collect these documents to be included with project sampling and the Project Engineer's file for each operation.

63-10.0800 PLACING BITUMINOUS MIXTURES

.0810 Preparation

.0811 Equipment Check - Before beginning bituminous paving operations, either the Project Engineer or paving inspector should make a visual check of the paver, distributor and rollers. Any apparent violations of the specifications should be brought into compliance before work starts. Once work is underway, any piece of equipment which fails to perform satisfactorily, in the judgment of the Project Engineer or the paving inspector, shall be replaced and/or parked as the case may be, until the situation is corrected.

It is not the responsibility of either the Project Engineer or inspectors to determine what is wrong with a piece of equipment, why it won't perform satisfactorily, or what it will take to repair it. This information should, however, be available from the contractor and should be documented in the daily inspector's report and project diary.

.0812 Final Base Check - On aggregate bases carrying traffic, chuck holes and raveled areas frequently develop in the sub-base between the time it is shaped and primed and the bituminous mat is placed. If the damage to the prime is extensive, it may be necessary to re-shape, and re-prime. In most cases, however, the base can be satisfactorily restored by filling holes and raveled areas with the mixture and compacting with the roller in advance of the paving operation. The maintenance of the prime coat is the responsibility of the contractor and any material used to fill holes and raveled areas in lieu of re-priming should be deducted from the final pay quantity. On resurfacing projects, the inspector should make a visual check of the tack coat application. Excessive material should be removed or covered with a blotter course of dry sand to prevent excessive tack from bleeding through the asphalt mat.

.0820 Placement

.0821 Paving Operation - When the paving machine is positioned on the roadway to be paved, the screed should be lowered onto blocks of the same thickness as the loose mat to be placed and the thickness screws nulled (adjusted). If starting from a previously laid mat, blocks of the same thickness as the difference between the loose and compacted mats should be used. The screed heater should be turned on and the screed heated to near the temperature of the mixture being placed. A guide such as a stringline should be set in a location to be easily visible from the operator's position on the paver. *This guide will normally be set well out in front of the paver operation and it should be checked and approved by the paving inspector early on so as to not interfere with the paving operation.* As soon as the screed has been heated to the desired temperature, or to a temperature that will lay the mixture without undue tearing of the surface, operations may be started. If operations are started from a transverse joint of a previously placed mat, the paver should be allowed to travel only a short distance and stopped until the joint has been made, rolled and straightedged by the use of a 10-foot (or 3-meter) straightedge furnished by the contractor. As soon as the joint has been made and straightedged, paving operations should be resumed. If segregation, tearing of the mat surface, or an uneven mat thickness is evident, the paver should be stopped immediately and should not resume until the cause is determined and corrected. It may be necessary to continue to run while adjustments are made but this should not continue indefinitely.

Handwork behind the paver should be held to the absolute minimum and all adjustments possible made to the paver and the mixture to be placed that would prevent excessive handwork. The workers handling the rakes or lutes should be alert to a crooked edge of the mat and correct it by cutting away and

discarding material, or filling indents with material from the hopper. If trucks are properly manipulated and the operator follows the preset guideline edge, corrections of the mat should not be necessary.

.0822 Ride Quality - Special attention is directed at Section 410 of the Standard Specifications, titled "Asphalt Pavement Ride Quality". This subject should be discussed with the contractor at the Preconstruction Conference in some detail. Items such as electronic controls, paver speeds, roller patterns, both longitudinal and transverse joints and material delivery should be discussed.

It is very desirable, on the part of the Department, that the contractor strives to achieve the best possible ride and, indeed, meets the criteria for outstanding work and earns the incentive payment. Past experience has indicated that this is not an easy accomplishment on the part of the contractor nor is it done without some effort and expense.

An incentive payment, when earned, will be entered in the pay estimate as a "Write-In" item with the payment based on calculations prescribed in Section 410.03.03 of the Standard Specifications. A change order, if necessary to obtain funds, should be processed promptly.

When the project is ready for testing the Project Engineer or the District Construction Office will request a Rideability Test by submitting Form TC 63-43 (Exhibit 63-10-1) to the Director, Division of Construction. The Director of Construction will endorse this request to the Pavement Design Branch of the Division of Highway Design and the project will be scheduled for testing. Normally, this request is made when the contractor and the Project Engineer jointly agree the project is ready to be tested. For all practical purposes, a project is considered ready for testing when the pavement to be tested is complete. Notice that this does not imply that the entire project has to be complete or even the shoulders since they are not involved in the testing. It is very important that the contractor maintains the lanes to be tested free from interference as far as the testing vehicle is concerned. It is also suggested that the lanes be swept and cleared of debris before these test runs are made. Such work normally enhances the test results, however, so it is not usually a problem.

There are several methods or procedures a contractor can employ to improve on the possibility of earning the incentive bonus for rideability. Several of these methods are discussed below:

Generally, a paver should use at least a 50 foot ski or an electronic equivalent

for sensor control when it must use a ski. The longer the ski, the smoother the pavement since it bridges small irregularities.

On new construction, the subgrade may be cut to grade with an autograde machine, such as a CMI™, sensing off a graded reference line or using GPS surveying. In this situation, a bituminous paver, in good working order, would need only the ski discussed above and good slope control to achieve high quality work. Better results can be obtained, however, by cutting the subgrade wide enough to accommodate a ski arrangement on both sides of the bituminous paving machine. In the case of the two-ski arrangement, the automatic slope control would be unnecessary as the skis would provide the proper slope on tangent and superelevated sections.

When the subgrade is prepared by graders, the best chance of consistently achieving high quality rideability on new construction is obtained by running the paver on a graded reference line. It is suggested that, at a minimum, the first two courses be laid using the reference line with remaining courses being laid using the fifty-foot ski arrangement.

.0823 Continuity of Operations - One of the first essentials of good paving operations is uniform continuity of operation. Good riding qualities are easier to obtain in a continuous operation than in a stop-start operation. Quality and rideability suffers when the paver must stop frequently.

If there is an appreciable delay in paver operations, it is good practice to run all the material out of the hopper and stop the paver just as the feed screws begin to run out of material. Before starting the paver again, sufficient hot material should be augured back to the screed, and the paver allowed to stand until the material that has lain in front of the screed has warmed. If the duration of the delay is such that the mix will completely cool out, a transverse joint should be made.

The speed of the paver should be adjusted to that speed which provides the best results for the type of mixture used, and that which coordinates satisfactorily with the rate of material delivery to the paver to provide a uniform rate of placement without intermittent operation of the paver. This also applies when using a Material Transfer Vehicle (MTV) to supply asphalt mix to the paver.

Transporting vehicles should be held against the paver to prevent bumping and spillage of material in front of the tracks or tires. Any spillage should be cleaned up, especially in front of tracks or tires, to prevent the formation of a

bump in the mat. Trucks should not be used to pull the paver. For successful operations, manipulation of thickness controls should be held to the very minimum. Quick and repetitive movement of the toe points to control thickness should be avoided. Moving parts of the machine should be operated at the recommended speeds.

.0824 Record Keeping - During the day's operation, the inspector or a helper should take the temperature of the mix as it is delivered and record it in the Daily Inspector's Report. The inspector should take frequent depth measurements to insure that the design thickness is being maintained. The inspector should check the amount of material placed against a theoretical tonnage for the same area. Required tonnage should be determined by actual roadway measurements and not by proposal quantity. Notify the Resident Engineer if proposal quantity is insufficient. Should a load of material be rejected for any reason, the word "VOID" and the reason should be written on front of the white ticket by the inspector and deducted from the accepted pay quantity. Also, voided load information and reason for deduction should be documented in the Daily Work Report for easier reference. A constant check of the yield will reduce the possibility of a significant overrun or underrun and will serve as an indicator of other problems such as poor or inaccurate slope control, out of typical, or paver malfunction . *The yield check is considered a critical part of the inspector's job and it must be maintained in an accurate and current manner.* The day's total should be recorded on the Daily Work Report maintained in Trnsport – SiteManager.

.0825 Compaction - Rollers shall meet the requirements of Section 403.02.08 of the Standard Specifications. Procedures for rolling shall be as stipulated in Section 403.03.10.

.0826 Desired Results - The object of rolling a bituminous pavement is not only to produce a good smooth riding surface, but is also to obtain a high degree of density and a very tightly knit surface which is essential to the durability of the bituminous mat.

.0827 Inspection - The Project Engineer should impress upon the inspectors the necessity of a close and continual observance of the rolling operation. The inspector(s) should have a thorough knowledge of the applicable specifications and be well briefed on the different types of rollers, their use, and limitations.

.0828 Timing - The timing of breakdown rolling, intermediate rolling, and final rolling is primarily dependent on the temperature of the mat which, in turn,

varies with the gradation of the aggregate, inherent stability of the mix, type and condition of foundation, and the atmospheric conditions at the time of placing. Past experience, both on the part of the paving inspector and the contractor's personnel may be combined with a limited amount of experimentation to determine the best procedure to obtain the desired results. In all cases, the breakdown roller should be kept as close behind the paver as possible without inflicting damage to the mat.

.0829 Failure to Perform - Failure of a roller to perform satisfactorily is grounds for removing the roller from operation until it is repaired. Depending on the severity and timing of the malfunction, the contractor may be allowed to finish the day's run with the roller but if the riding quality is being adversely affected or other ill effects are noticeable, the roller should be removed from the operation even if it means suspending the operation for lack of a replacement.

.0830 Joints

.0831 General - Joints shall be constructed as directed by Section 401.16 of the Standard Specifications. In all probability, more criticism is directed toward joints than any other phase of bituminous concrete pavement construction. The subject of joints include both longitudinal joints and transverse joints, and also includes the joint between an asphalt surface and a Portland cement concrete slab or a concrete curb and gutter.

.0832 Staggered Joints - Perhaps one of the most critical aspects in the construction of a joint as related to a long life and good service of the bituminous pavement is the staggering or offsetting of all joints regardless of whether they are transverse or longitudinal.

Longitudinal joints should be place according to section 403.03.07 of the standard specifications. Care should be taken on all projects to offset the joint from true centerline so that pavement markers and striping are not placed on the joint. Striping crews need to be alerted so that the centerline is not striped in an offset position. By offsetting the joint, it allows for joint sealing and helps to keep raised pavement markers in place.

Transverse joints should be offset with relation to a joint established in a preceding layer a minimum of ten feet (or three meters) whether on new construction or a resurfacing project. Transverse joints resulting from adjacent courses of bituminous material should be located a minimum of one hundred feet (or thirty meters) apart.

.0833 Longitudinal Joints - On longitudinal joints, it is very important that a high degree of density be obtained in the pavement, or against a curb and gutter. If insufficient material is placed above the level of a previously compacted lane to allow for compaction of the mat being placed, the roller will be supported by the previously placed mat and the material, for a short distance from the joint, will not be adequately compacted. Ideally, the surface on either side of the joint should match perfectly after rolling, but it would be much better to have slight surplus of material and a slightly higher elevation of the lane being placed, thereby insuring the desired density, than to obtain an absolutely smooth transition from lane to lane with subsequent raveling. By observation, it can be determined how much the mat will be compressed when rolled. The mat being placed should be of such a thickness that, after compaction, it will be flush with the elevation of the previously compacted lane.

To properly construct a longitudinal joint, the paver screed should overlap the previous compacted lane by one to two inches and should leave the material higher than the previous compacted pass by the amount of consolidation being obtained under final rolling.

.0834 Transverse Joints - Transverse joints should be held to the minimum in any pavement structure. When it becomes necessary to make a transverse joint, however, the following procedure is recommended: The paving machine should be stopped when all material is emptied from the hopper and a roll of approximately 500 pounds of material is left in front of the screed. The paver should be stopped at this time because the mat thickness will decrease due to the weight of the screed as the material tends to run out. The screed should be lifted and paver moved off the roadway. Workmen using smooth blade shovels should then cut a straight line transversely for the full depth of the mat and to a width of 18 inches or more in the area the screed stopped. A piece of oil paper, canvas, or other suitable material that will extend the full length of the joint should be laid down that will provide an unbonded joint over the vertical face previously cut with the shovels. Using a portion of the available excess bituminous material, a temporary ramp is then constructed for the full width of the mat to provide a smooth transition from the mat to the original surface. Any unused excess material is then discarded. The roller should roll the joint as soon as possible using the same pattern of rolling as used in the mat.

For best results the vertical face should be at right angles to the lane or roadway. When proceeding from the joint, the paver should be positioned so the leading edge of the screed is just back of the joint and supported on the

cold mat by wooden or metal blocks. The wood or metal blocking should have a thickness equal to the amount of consolidation expected after compaction. The screed should be heated, and the distributing screw box filled with hot material to the normal operating level before starting to pave away from the joint.

In all instances, transverse joints should be carefully constructed and thoroughly compacted to provide a smooth riding surface. A rough joint in the base may very well affect the riding qualities of the surface. The joint should be straightedged for smoothness while it is hot and material added or removed as necessary to provide an unnoticeable joint in the finished surface. If it is necessary to add or to remove material after the joint is rolled, the high or low area should be loosened with a rake to a depth of approximately one-half inch and material added or removed as necessary and re-rolled.

.0840 Bituminous Indented Rumble Strips - The construction of bituminous indented rumble strips are considered a significant safety enhancement and well worth the attention and efforts of both the Project Engineer and the contractor. The procedure outlined below is developed around the equipment most frequently used for this purpose, however, it is not the only equipment used and there may be variances of this procedure just as effective. The requirements of roller timing, roller weight, proper alignment, correct depth and spacing and minimal distortion are all important factors and should be monitored closely regardless of the equipment.

Equipment - A steel wheel tandem roller should be used for this purpose. Metal strips of the configuration required should be welded to the drive wheel of the roller. The strips should be attached symmetrically about the center of the drive wheel and spaced to produce intervals of indentions required. This construction task can be accomplished through other equipment configurations. If the contractor chooses to utilize an alternate equipment configuration then the effectiveness of the apparatus must be observed and approved by the Resident Engineer. The roller should be equipped with a guide to uniformly maintain the required distance of rumble strips from the edge of the travel way. The roller must be in good mechanical condition and equipped with a good watering system to insure wheels are kept wet, particularly the wheel with the indention strips.

Construction Procedure - As in any bituminous paving operation, the breakdown roller should follow as close behind the paving machine as practical to pinch and seal the joint adjacent to the previous mat. The breakdown roller should make one complete pass over the mat before the rumble strip operation is started.

The rumble strip operation should be started when the temperature of the mix is in the range of 160 deg.F,(or 20 deg. C) plus or minus 5 degrees. If the mix is too hot, the material will adhere to the indention strips and, if it is too cold, the area around the indention strips will be torn and the depth of the rumble could be too shallow. It is, therefore, important that the indention operation be started and continued at or near the optimum temperature.

The roller should be operated at about the same speed as the paving machine, or about 80 to 100 feet (or 24 to 30 meters) a minute. The roller has time to press the contact strip firmly into the mat at this speed. If the roller is operated too fast, it will maintain a jumping, clawing rhythm and leave distorted indentions.

The roller should always be operated with the idle, or guide wheel forward. The operator should set the guide so as to uniformly maintain the required distance from the edge of the travel way.

The finish roller should not roll onto or over the indention strips except to correct some distorted indentions.

NOTE: A three wheel roller is not good for this operation because the guide wheel runs on the break between the pavement and the shoulder and it is hard to steer and maintain uniform distance from travel way. The indention strips also have to be put on the pulling wheel and it digs in on the high side and is too light on the outside.

In the event of an oversight and required rumble strips are not rolled in, the rumble strips shall be installed by sawing as specified in section 403.03.08 in the Standard Specifications. There will be no consideration for elimination of the rumble strips. In addition, sawed rumble strips only should be placed on the interstate and parkway system according to 403.03.08 of the standard specifications.

63-10.0900 ASPHALT MIXING PLANTS

ASTM D995 provides some general descriptions of various types of asphalt mixing plants. There are, in general, two types of plant operations used in Kentucky. Each of these shall conform to Section 401 of the Standard Specifications.

The batch plant - where the aggregates are proportioned by weight in a hopper and the asphalt material proportioned by weight or volume.

The dryer drum plant – where the aggregates are proportioned by weight over calibrated belt

scales and the asphalt liquid is added by weight also by calibration of the asphalt pump.

Prior to beginning the construction season, the contractor shall submit a Quality Control Plan (QCP) to the appropriate District Materials Engineer (DME) for approval for each plant using form TC 64-418 in accordance with KM 64-426 (*Requirements For Process-Control Testing and Inspection of Asphalt Mixtures by the Contractor*). This document outlines the sampling, process-control, inspection and the anticipated frequencies of each.

Asphalt mixing plants shall comply with the requirements of Section 401 of the Standard Specifications.

.0910 Aggregate Stockpiles - Aggregate stockpiles shall be provided and maintained in accordance with Section 401.02.01 of the Standard Specifications. The contractor is responsible for maintaining and checking aggregate stockpiles as part of his process control responsibilities as outlined in KM 64-426.

.0920 Asphalt Plant Inspection – Asphalt mixing plant inspection must comply with Section 401 of the Standard Specifications. Plant setup and quality control inspection shall be in accordance with Sections 402 of the applicable edition of the Standard Specifications. The District Materials Engineer normally oversees these activities. The following personnel are involved in bituminous plant setup and quality control inspection. The duties and responsibilities of these individuals are explained in the Section 402 of the Standard Specifications, KM 64-426, Section 303 of the Materials Guidance Manual and in the Asphalt Section of the Sampling Manual.

.0930 The Superpave Plant Technologist (SPT) - The Contractor shall provide a qualified SPT to be present during production and to perform the daily inspection, process control, and acceptance testing at the plant site. The District Materials Engineer(DME) or Resident Engineer will provide a qualified SPT with the duty of verifying the contractor's acceptance test (one sublot per lot) and performing acceptance testing of density cores for compaction Option A mixtures (four mainline cores for each type of mixture and two joint cores for surface mixtures per sublot).

.0940 The Superpave Mix Design Technologist (SMDT) - The contractor shall provide a SMDT to be responsible for the submission of all mix designs and making adjustments to the mixture during production. The Department will use a qualified SMDT for approval of all mix designs.

.0950 Field Laboratory - The contractor shall furnish and maintain a field laboratory according to Subsection 106.03.02 of the Standard Specifications. The laboratory

must be inspected and qualified according to the Department's Quality Assurance Program for Materials Testing and Acceptance and meet the minimum requirements as outlined in Section 401.02.01 of the Standard Specifications. The laboratory shall be equipped with all the required equipment necessary for the plant inspector to accurately perform the testing required by the specifications. The contractors SPT should be equipped with a copy of the job-mix formula, a project proposal, the standard specifications, and a computer for the purpose of recording and submitting test data on the AMAW.

.0960 Necessary Tests – The Contractor is responsible for notifying the Engineer of the intent to start a minimum of 24 hours before beginning production and furnish the facilities, equipment, personnel and other resources needed to comply with KM 64-426 and KM 64-435. The Contractor must provide a Quality Control Plan (QCP) and complete the setup duties of KM 64-421 and prepare and submit 2 hand-mixed gravities to the Engineer before the start of the second day of production. After the setup period, the contractor's SPT is to perform the process control operations of KM 64-426 and enter the test data into the Asphalt Materials Acceptance Workbook (AMAW). The Resident Engineer or the DME shall provide a qualified SPT or SMDT for the purpose of verifying the contractor's acceptance test (one sublot per lot) according to KM 64-435 and enter the verification data into the AMAW.

Additional Responsibilities

The Department's qualified SPT or SMDT should witness the contractor obtain a PG binder sample at the required frequency as outlined in the Sampling Manual or in Sitemanager Materials. Submit the samples to Central Office Materials along with the bill of lading and certification.

The DME or the Resident Engineer shall obtain the Excel spreadsheet from the contractor within 5 working days of the completion of each lot of material and assign a Sitemanager ID and upload the spreadsheet into Sitemanager.

.0970 The Project Engineer - The Project Engineer has direct authority over the preparation and operation of an asphalt plant within the limits imposed by the Standard Specifications with respect to materials being produced or about to be produced for an assigned project. This definition of authority is not meant to preclude or intrude upon the responsibilities of the District Materials Engineer. The District Materials Engineer is charged with certain authority and responsibilities regarding an asphalt plant producing material for state use, the execution of which are vital to the welfare of the project. Both the Project Engineer and District Materials Engineer should be aware, however, that when

the District Materials Engineer is operating under the authority of a project number, he is operating under the authority of the Project Engineer who has been assigned the project responsibility. In the final analysis, it is the Project Engineer who must stand responsible for the end results.

Good communication and cooperation between the Project Engineer and the District Materials Engineer is extremely important to the proper operation of bituminous plants and, for that matter, to the entire project. Each office shall see that the other is properly notified of project related activity in a prompt and timely manner.

The DME must be fully aware of the documentation and testing procedures required to establish the plant as an approved source of material and to operate on a daily basis. The DME must check to see that such tests are run and that adequate documentation is received by his office.

.0980 Weighing and Verification - The asphalt mixture shall be weighed at the mixing plant. The scales at the asphalt mixing plant must comply with Subsection 401.02 of the Standard Specifications. The scales for weighing the mixture shall be checked and given a certificate of accuracy prior to the start of the construction season and shall be rechecked periodically as specified in Section 109.01.02 of the Specifications. The method for weighing of materials shall be as specified in Section 109.01 of the Standard Specifications.

.0990 Hauling Equipment - It is the responsibility of the Project Engineer or DME to inspect and approve all hauling equipment. Trucks failing to meet the requirements of Section 403.02.06 of the Standard Specifications shall not be used on the project.

63-10.1000 BITUMINOUS PAVERS

There are many types of pavers used in placing bituminous concrete pavements. Some of the new modern pavers are extremely sophisticated; however, all known pavers meeting the requirements of Section 401.11 of the Standard Specifications which are in good operating condition are capable of producing satisfactory results. *Note that this specification requires that the augur and vibrator operate the full width of the screed.*

Before placing bituminous mixture with the paver, the inspector should become familiar with accepted practices of the operation of the particular paving machine to be used and also with the principles of its nomenclature. Handbooks of the various details and operating instructions are usually obtainable from the contractor or the manufacturer.

As with any other construction operation, cooperation between the paving inspector and the contractor's foreman or superintendent usually results in a better understanding of the equipment functions, and the entire paving operation, and a better finished product.

It is not the responsibility of either the Project Engineer or the Paving Inspector to make actual adjustments of a bituminous paver. Paver adjustments are the responsibility of the contractor and should be so requested, when necessary. It is, however, the responsibility of the Project Engineer and the Paving Inspector to be thoroughly familiar with the type paver being used, its adjustments and the reaction to these adjustments. This knowledge is very important and will contribute substantially toward obtaining the best possible bituminous surface.

It is for this reason that the following information on bituminous pavers is included in this manual.

.1010 Paver Characteristics - There are three brands of pavers most frequently used in Kentucky. They are the Barber Green, the Cedar Rapids, and the Blaw Knox pavers. Some characteristics and principles are common to several of the machines and will be discussed, followed by an outline of the differences and adjustments peculiar to each individual machine.

All machines consist of two basic units, the tractor unit, which includes the receiving hopper, distributing screws, power plant and controls; and the screed unit, which strikes off the mixture and provides the initial compaction, and includes screed heaters, thickness and crown controls.

.1020 Mobility - The mobility for all machines is furnished by pneumatic tired rollers or crawlers. The crawler mounted unit should be checked prior to paving operations to see if the crawlers are snug but not tight. If they are too loose, it is possible for the sprockets, on which the crawlers are mounted, to climb the crawlers with a rhythmic bumping movement. This movement is reflected to the screed, which in turn causes a ripple effect in the surface of the pavement. In the pneumatic-tired equipment, tire pressure should be checked and inflated to the pressure specified by the manufacturer.

.1030 Screed Unit - The screed unit of all machines is towed by long arms attached to pivot points located forward on the tractor unit, permitting the screed to operate on a floating principle which tends to compensate for irregularities in the base which affect the tractor unit. The method of adjusting the mat thickness and the distance in which the change takes place differs somewhat between the various machines. On the Cedar Rapids and the Barber Green machines the screed seeks a level such that the bottom of the screed is parallel to the direction to pull, and adjustments in the thickness of the course being placed are made by tilting the

screed up or down around the pivot pin just above the screed. On the Blaw Knox machine, the connection between the screed and the arm attached to the tractor unit is rigid. The tilt of the screed is changed by raising or lowering the pivot point of the arm at the tractor unit. Although the method of effecting the change in thickness is different, it is conceivable that the principle is the same. The screed is supported by the mat being placed. Since it is free to float, it is therefore possible to make an immediate change in thickness while the machine is either idle or moving.

When the thickness controls are adjusted, the screed seeks a new level, up or down, when the machine moves forward, yet the total effect of the change may not be realized until the machine has moved several feet (or meters). Therefore, the machine should be allowed to move at least fifteen feet (or five meters) before subsequent changes are made. The sensitivity of the controls differ widely between machines and the maximum amount of adjustment that should be made at any time varies with each machine. The amount of change in thickness that will be produced by any given adjustment in the controls depends on the mixture being placed, so it's impossible to say that a particular adjustment will change the mat thickness a definite amount. However, in the Barber Green Paver approximately 2 1/2 turns of the thickness control will change the mat thickness approximately one inch (or 25 mm). Accordingly, the maximum adjustment at any one time should be limited to approximately 1/4 inch (or 6 mm). It takes approximately eight turns of the thickness control handle to produce a change of one inch (25 mm) in mat thickness with Blaw Knox machine, so approximately one turn could be permitted at any one time. Conversely, the thickness control on the Cedar Rapids machine is much more sensitive, and control adjustments should be limited to only one notch of the control handle at any one time.

.1040 Flow Control Gates - All paving machines have adjustable flow control gates which regulate the amount of mixture carried from the receiving hopper to the distributing augers. They should be set to keep the augers at least two-thirds covered with material when the slat feeders are operated 80 to 90 percent while the paver is in motion. In all cases the feed should be set to accommodate the mat thickness and should never be set to the extent that the material in front of the screed will intermittently rise and fall. Flooding and starving the screed produces a rough, segregated texture and imperfections in the finished surface. Most modern pavers are equipped with automatic devices which control the flow of material to the screed. The adjustment of the sensing device and the flow gates should be so coordinated that the feeders operate most of the time. All machines have provisions for adjustment of crown in the screed. It is usually desirable to provide a slight amount of crown in the screed to avoid the appearance of the mat being low in the center of the lane being paved. Usually the crown allowed on

rural type pavements is 1/8 inch(or 3 mm); however, urban cross-slopes may require special adjustments as directed by the Project Engineer. The crown at the front edge of the screed should be a 1/16 inch(or 1.6 mm) higher than the back. This differential may vary with the type of material being placed, but is usually helpful in improving surface texture across the paved width.

.1050 Initial Compaction and Strike-Off - With the Barber Green machine, initial compaction is obtained by a tamping bar which also strikes off the material for the screed. The tamping bar moves up and down at the rate of 1,200 to 1,500 times per minute, the vertical travel being 1/8(or 3 mm) inch for each stroke. The limits of vertical travel of the tamper bar is a very important adjustment of the paver, as it has a great influence on the appearance of the finished surface. The horizontal face of the tamper bar should extend 1/64 inch (or .4 mm) below the bottom of the screed plate at the bottom of the vertical stroke. Should the tamper bar come down too far, or not far enough, the resulting effect may be a scuffed or open textured surface. The tamper bar is beveled on the front face reducing the width of the bottom edge to 1/4 inch (or 6.4 mm). The bottom edge strikes off the material so the screed can ride over it. The beveled front face of the tamper primarily compacts the mixture as the paver moves forward. The tamper gradually wears with use and will eventually develop a knife edge. When this occurs, the same type of surface imperfections will appear as described above. When the bottom edge of the tamper bar wears to approximately one-half of its original thickness, it should be replaced. Screed plates should be checked frequently. The plate usually wears out first about four to six inches(or 100 to 150 mm) from the trailing edge. The first indication will be either a concave undulation or actual ripples in the surface of the plate. When the screed has been extended they should be checked for proper bolting and that they form a true extension of the tamper bar and the screed plate.

Some Barber Green pavers are mounted on rubber rather than tracks and some are equipped with a vibratory screed rather than tamper bars, leveling screed combination. Much of the foregoing discussion of the adjustments and features of the Barber Green paver also applies to the Blaw Knox machine. Initial compaction is accomplished by a tamping bar, but it is in two sections. The vertical travel is 3/8 inch (or 9.5 mm) per stroke, and the lower limits of travel should be 1/64 inch (or .4 mm) below the screed plate. Clearance between the tamper and the screed should be five to ten thousands of an inch. The tamper is provided with a 2-speed transmission. The slower speed is recommended for paving speeds of up to twenty-eight feet (or 8.5 meters) per minute; higher paving speeds require the higher tamping speed. On the Blaw Knox machine the height of the distributing augers is also adjustable. The height can be varied to produce the best results with the material being placed, but generally five inches clear

above the existing surface will produce satisfactory results.

It is important that the tires on the Blaw Knox paver be maintained at a uniform pressure for all tires. The manufacturer recommends a minimum of 35 p.s.i.(or 241 kPa) when hydro-inflated and 90 p.s.i(or 621 kPa). when air only is used.

The Cedar Rapids machine differs from those previously mentioned in that the screed itself strikes off the material and provides the initial compaction by means of four electronic vibrators. The intensity of vibration for each of the vibrators may be controlled by adjustment of individual rheostats. Normally, the rheostats are set at about one-fourth open to start and adjusted for best appearance of the mat.

.1060 Automatic Screed Control - Section 401.11 of the Standard Specifications requires that all bituminous concrete pavers be equipped with automatic screed controls with sensors, and defines the limits whereby implementation of these electronic controls are optional or mandatory.

.1070 Adjusting Grade and Cross-Slope - Automatic screed control devices are designed to maintain desired grade and cross-slope by raising or lowering, automatically, the pivot point of the screed arms to control the screed angle of attack. The elevation is indexed from a reference independent of the tractor unit of the paver, which may be stringline, a traveling ski, or a matching shoe on the previously compacted surface, or uncompacted surface when pavers are operated in tandem.

.1080 Primary Components - The five main components of an automatic screed control are the sensor, pendulum, control box, command panel, and electric motors to activate cylinders to change the screed tilt, automatically compensating for irregularities in the roadway surface. Automatic screed controls were designed to improve:

Smoothness of horizontal alignments;

Prevent sway in the typical cross-section.

The sensor gets its information from a sensing device riding on a grade reference which may be a ski-like arrangement or a shoe riding on the grade itself. The type of external reference to be used depends upon the existing surface and the desired end results. If the existing surface does not provide the desired riding quality or if it is desired to pave to a predetermined profile grade, an effective stringline or ski-like arrangement is required.

The ski-like arrangement for some pavers is of the hinge type with a spring loaded equalizing line, while others are of the equalizing pressure type. A 20 to 30-foot ski is usually desirable where sharp vertical curves exist in the roadway profile, while a 4-foot would be most preferable on flat profiles. It should be noted that the paver will only lay to the accuracy of the reference and will not correct any errors in the reference.

The matching shoe is designed to match a previously laid compacted or uncompacted mat, and can also be used effectively in conjunction with a ski to match a gutter grade, when slope control is not specified, providing the gutter grade is satisfactory.

.1090 Adjustments - When an automatic screed control system is used it may be operated in manual, semi-automatic, or fully automatic position. In the manual position, the mat thickness is controlled with the thickness control screws, as with any conventional machine. In the semi-automatic position, one side of the screed is controlled by the system. In the fully automatic position, both sides of the screed are controlled by the system and the thickness screws are not used to change mat thickness. Once the operation is started, adjustment in mat thickness, if necessary, should be made with the sensor control screws. Adjustments can be made with the grade control knob on the command panel, but this is not as easy and convenient. The manual screed controls should not be used for adjustments in mat thickness when the screed is once set in the full automatic position.

CHAPTER TEN

TITLE	EXHIBIT NUMBER
Rideability Test Report (TC 63-43)	63-10-1
**Request for Rideability Test	

Exhibit 63-10-1

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS

TC63-43
Rev. 02/96 Mod. 06/07

RIDEABILITY TEST REPORT

PROPOSAL CODE NO: _____ DISTRICT NO. : _____

LETTING DATE: _____ MARS JOB NUMBER : _____

CONTRACTOR: _____

PROJECT NO. : _____ ROUTE: _____ COUNTY _____

LOCATION FROM: _____ MI. PT. _____

TO: _____ MI. PT. _____

COMMENTS: _____ LENGTH: _____

REQUESTED BY: PROJECT ENGINEER _____ DISTRICT OFFICE _____ DIV. OF CONST. _____ CONTRACTOR _____

NAME: _____

COMMENTS: _____

DATE: _____ DATE RI NEEDED _____ REQUIRED RI _____

OLD PAVEMENT AC _____ PCC _____ COMPOSITE _____ OTHER _____

THICKNESS DGA _____ PCC _____ AC. SURF _____ BASE _____ BINDER _____ OGFC _____

SURF. PREP: MILLING _____ SCRATCH COURSE _____ LEVEL & WEDGE _____

OTHER EDGE DRAIN (TYPE) _____

NEW PAVEMENT NEW CONST. _____ OVERLAY _____ MILL & AC INLAY _____ BK. & ST w/ OVERLAY _____

SUBGRADE: SOIL _____ ROCK _____ LIME MOD _____ CEMENT MOD _____ MECH MOD _____

THICKNESS OF: DGA _____ CSB _____ TR DR BLK _____ UNT DR BLK _____ PCC _____

AC SURF: (CLASS) _____ SURF _____ BINDER _____ BASE _____ DESIGN EAL _____

EDGE DRAIN (TYPE) _____ CBR _____ ADT _____ SAMI ○ Yes ○ No

Was MTD (Material Transfer Device) used: ○ Yes ○ No If 'YES' indicate Pavement Type: ○ Surface ○ Base

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TEST DATE: _____ DEGREES F: _____ WEATHER _____

TESTED BY: _____ PVMT TYPE _____

STRIP CHARTS TO: _____ DATE: _____

PURPOSE OF TEST CHECK _____ ACCEPTANCE _____ AFTER CORR. _____ OTHER _____

COMMENTS: _____

			IRI			RIDEABILITY INDEX			PERCENT PAY		
	DIRECTION	MILEPOINTS	LANE 1	LANE 2	LANE 3	LANE 1	LANE 2	LANE 3	LANE 1	LANE 2	LANE 3
1											
2											
3											
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14											

RESULTS VALIDATED BY: _____ DATE: _____